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Application No. S2003/0915

Date of Filing 5 December 2003

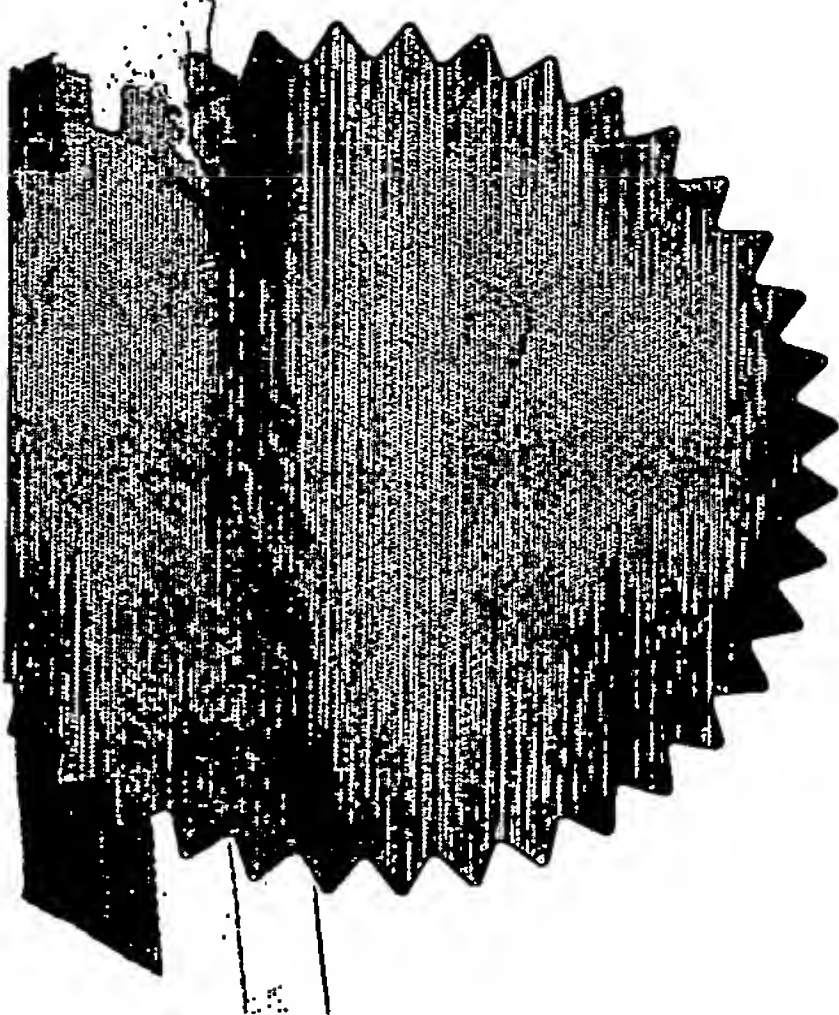
Applicant THOMAS WILLIAM FLEMING, an Irish citizen,
of Jamesbrook, Midleton, County Cork, Ireland.

Dated this 12 day of May 2004.

PRIORITY DOCUMENT
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REQUEST FOR THE GRANT OF A PATENT

PATENTS ACT 1992

The Applicant(s) named herein hereby request(s)
[] the grant of a patent under Part II of the Act
[X] the grant of a short-term patent under Part III of the Act
on the basis of the information furnished hereunder.

1. Applicant(s)

FLEMING Thomas William
Jamesbrook
Midleton
County Cork
Ireland
an Irish citizen

2. Title of Invention

A cable reel

3. Declaration of Priority on basis of previously filed application(s) for same invention (Sections 25 & 26)

<u>Previous Filing</u> <u>Date</u>	<u>Country in or for</u> <u>which filed</u>	<u>Filing No.</u>
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4. Identification of Inventor(s)

Name(s) and adresse(s) of person(s) believed
by the Applicant(s) to be the inventor(s)
Thomas William Fleming
an Irish citizen of Jamesbrook, Midleton, County Cork, Ireland.

5. Statement of right to be granted a patent (Section 17(2) (b))

6. Items accompanying this Request

- (i) [X] prescribed filing fee (Euro 60.00)
- (ii) [] specification containing a description and claims
- [X] specification containing a description only
- [X] Drawings referred to in description or claims
- (iii) [] An abstract
- (iv) [] Copy of previous application(s) whose priority is claimed
- (v) [] Translation of previous application whose priority is claimed
- (vi) [X] Authorisation of Agent (this may be given at 8 below if this Request is signed by the Applicant(s))

7. Divisional Application(s)

The following information is applicable to the present application which is made under Section 24 -

Earlier Application No.

Filing Date:

8. Agent

The following is authorised to act as agent in all proceedings connected with the obtaining of a patent to which this request relates and in relation to any patent granted -

Name & Address

Cruickshank & Co. at their address recorded for the time being in the Register of Patent Agents is hereby appointed Agents and address for service, presently 1 Holles Street, Dublin 2.

9. Address for service (if different from that at 8)

Signed Cruickshank & Co.

By:-

C. Schmitt

Executive.

Agents for the Applicant

Date December 05, 2003.



"A Cable Reel"

This invention relates to cable reels and in particular to cable reels of the type comprising a central cable receiving core mounted between a pair of disc like end flanges.

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Cable reels have been used for many years in a variety of different fields. Typically though, cable reels are used to store a length of cable such as wire, garden water hose, electrical cable or tape in a safe and secure manner until such time that the cable is required. When the cable is required for use the desired amount of cable may be paid out gradually from the cable reel in an orderly manner. Once the cable has served its purpose and is no longer required it may be reeled back up onto the cable reel until needed once again.

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There are however problems with the known types of cable reels. Very often, the amount of cable stored on the cable reel will be substantial and together with the cable reel may weigh as much as between twenty to thirty kilos. The cable reel becomes unwieldy and difficult to manipulate and must be placed on the ground before rolling the cable reel along the ground about its disc like end flanges in order to unravel or wind up the cable about the reel. Due to the fact that the end flanges are necessarily greater in diameter than the cable receiving core, when winding the cable up about the reel, slack forms in the cable. This slack leads to loosely stored cable that may result in all the cable not being protected by the end flanges when in a stored position. Furthermore the loosely packed cable can be difficult to subsequently unravel and if left unattended may lead to kinks forming in the cable. In order to prevent the build up of slack the operator of the cable reel must manually drag the cable reel backwards along the ground to tighten the cable about the cable receiving core before the cable reel may be rolled along the ground again. This is often very difficult and tiring to do particularly when a large amount of cable is to be wound about the cable reel.

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When the cable is being paid out from the cable reel the opposite effect on the cable is produced and the cable becomes taut as the end flanges are rolled along the ground. This

leads to slippage of the cable reel along the ground and can lead to damage to the cable reel. This can also lead to the cable reel becoming unwieldy and difficult to manipulate and the cable reel will tend to veer off to one side or the other instead of holding a straight line. Alternatively, certain types of cable may be stretched or otherwise damaged by placing the cable under tension which is undesirable.

Another problem with certain known types of cable reel, and in particular those types of cable reel that have a pair of handles rotatably mounted on the cable reel to enable the cable to be wound or unwound about the core, is that the handles have to be mounted as close to each other as possible to prevent oscillation of the cable reel from side to side when the cable is being wound up. Typically, in order to mount the handles as close together as possible, the cable receiving core has a central bore accessible through a hole in one end flange and a handle is rotatably mounted at the bottom of the central bore. In this way, the two handles will be mounted in substantially the same plane and the cable reel will have a lesser tendency to oscillate back and forth when rotated. There is however a problem with this type of arrangement. Due to the fact that the operators hand must be placed through the central bore to grip the handle, the operators hand and more specifically their knuckles will often rub against the side walls of the central bore and their wrist may rub against the end flange at the mouth of the bore. This can cause chaffing and severe discomfort to the operator which is highly undesirable.

It is an object therefore of the present invention to provide a cable reel that overcomes at least some of these difficulties that is both inexpensive to produce and simple to operate.

Statements of Invention

According to the invention there is provided a cable reel of the type comprising a cable receiving core mounted between a pair of disc like end flanges characterized in that the cable reel further comprises a pair of operating flanges having a greater diameter than the end flanges, the end flanges and operating flanges being freely rotatable with respect to each other. By having a pair of operating flanges with a diameter greater than the end

flanges the operating flanges rather than the end flanges will make contact with the ground and the cable reel will roll along the ground about these operating flanges. Due to the fact that the operating flanges and the end flanges are freely rotatable with respect to each other, when the cable is being fed out from the cable reel, the cable will not become taut as the cable is able to be fed out at a speed faster than if the end flanges had been in contact with the ground. The cable can therefore be paid out at the same speed as that dictated by the movement of the operating flanges along the ground. The cable will not be stretched or damaged in any way.

Furthermore, when it is time to wind the cable up about the cable reel once again the operator may simply manipulate the end flanges at their desired speed which will cause the cable to be wound up on the cable receiving core. Slack will not form in the cable as the rate at which the cable is wound around the core is no longer dictated by the rate at which the ground engaging flanges are rotated along the ground. The operator of the device will not have to repeatedly drag the entire cable reel along the ground in order to remove the slack from the cable and the cable may be wound around the cable receiving core in a more compact and organized manner.

In another embodiment of the invention there is provided a cable reel in which the operating flanges are mounted external the end flanges relative the cable receiving core. This will provide a simple construction of cable reel that is cost efficient and less difficult to manufacture. Furthermore, the cable reel will be simple to manipulate by the operator allowing the cable to be wound or unwound in a quick and efficient manner.

In a further embodiment of the invention there is provided a cable reel in which the cable receiving core is substantially hollow and the pair of operating flanges are connected together by way of a central elongate strut passing through the hollow cable receiving core and connected to each of the operating flanges at its ends. This is seen as a simple embodiment of cable reel that will be cost efficient and relatively simple to manufacture. The use of expensive bearings and the like are avoided by providing a cable reel having this construction.

In one embodiment of the invention there is provided a cable reel in which the central elongate strut is telescopic so that the pair of operating flanges may move towards and away from each other. By having a telescopic strut the operating flanges may be spaced
5 apart when it is desired to roll the cable up on the cable reel thereby giving the operator sufficient room to manipulate the end flanges with their hands. Furthermore, by having the operating flanges spaced as far apart as possible the cable reel will be less inclined to diverge off course and will therefore require less human intervention when the cable is being paid out. The operating flanges may then be brought in close together when the
10 cable reel is being stored to enable the cable reel to be stored in the most compact manner possible. Preferably, there will be provided a locking mechanism to hold the two operating flanges in position relative to each other. This will prevent the two operating flanges from rotating at different speeds which would cause the cable reel to diverge off course when the cable was being paid out. This will also prevent the operating flanges
15 from collapsing inwardly when the cable is being wound about the cable reel which could cause injury to the operator.

In another embodiment of the invention there is provided a cable reel in which the locking mechanism is a bayonet fitting. This is seen as a particularly simple and cost
20 effective fitting to use as the locking mechanism.

In a further embodiment of the invention there is provided a cable reel in which there is further provided an additional locking mechanism to releasably secure the operating flanges and the end flanges in position relative to each other. This is seen as a useful
25 feature as it may in certain circumstances be preferable to have the two pairs of flanges connected together. One example of such a situation would be to prevent inadvertent unraveling of the cable from the cable reel when not in use. In order to unravel, the entire cable reel would have to be moved thereby preventing inadvertent unraveling.

30 In one embodiment of the invention there is provided a hand held cable reel of the type comprising a cable receiving core mounted between a pair of disc like end flanges, a

handle mounted on the outermost surface of one of the disc like end flanges radially offset from the central axis of the core, characterized in that there is a central bore extending substantially the length of the cable receiving core and accessible through a hole in the other end flange and a rotatably mounted inner handle located at the bottom of the central bore and not protruding outside the bore, the inner handle comprising a base portion rotatably mounted on the cable reel and a handle portion secured to the base portion, the base portion further comprising an outwardly projecting lip substantially surrounding the base portion and extending outwardly therefrom so that the hand of an operator may be placed on the handle with the lip substantially surrounding the hand of the operator to prevent injury of the operator's hand on rotation of the handle. This will prevent the operators hand and in particular their knuckles from rubbing against the interior of the bore and becoming chaffed over time as their hand moves relative the interior of the bore.

In a further embodiment of the invention there is provided a hand held cable reel in which the outwardly projecting lip further comprises an annular flange projecting outwardly and substantially orthogonal to the lip and which lies along the external face of the flange. In this way the wrist of the operator will also be protected from rubbing against the flange as the operators hands are used to rotate the cable reel. Their wrists will in fact rest against the annular flange which will not be rotating relative their wrist.

Detailed Description of the Invention

The invention will be more clearly understood from the following description of some embodiments thereof given by way of example only in which:-

Fig 1 is a perspective view of a cable reel according to the invention;

Fig 2 is a cross-sectional view along the lines A-A of the cable reel of Fig 1;

Fig 3 is a cross-sectional view of an alternative embodiment of cable reel according to the invention;

Fig 4 is a cross-sectional view of a locking mechanism used with the cable reel of Fig 3;

Fig 5 is a cross-sectional view of another still alternative embodiment of cable reel according to the invention;

Fig 6 is a cross-sectional view of an alternative embodiment of cable reel similar to that shown in Fig 3 with a locking mechanism provided;

Fig 7 is a cross-sectional view of an alternative embodiment of locking mechanism for use with the cable reel shown in Fig 6;

Fig 8 is a cross-sectional view of another still alternative embodiment of locking mechanism for use with the cable reel shown in Fig 6;

Fig 9 is an exploded view of an alternative embodiment of locking mechanism according to the invention; and

Figs 10(a) and 10(b) are cross-sectional views of the locking mechanism shown in Fig 9.

Referring to the drawings, and in initially to Fig 1 thereof, there is shown a cablereel, indicated generally by the reference numeral 1, having a cable receiving core 3 mounted between a pair of disc like end flanges 5, 6 and a pair of operating flanges 7, 8 having a greater diameter than the end flanges and being freely rotatable with respect to the end flanges. The operating flanges are located external the end flanges relative the cable receiving core. A cable 9 is wound around the cable receiving core 3.

In use, the cable reel is placed on the ground so that the outer rim 11 of each of the operating flanges will rest on the ground and both the end flanges and the cable will be

held spaced apart from the ground. In order to pay out cable from the cable reel the operator of the cable reel affixes the free end of the cable to a post or the like and then rotates the cable reel in the known manner until a sufficient amount of cable is paid out. The operating flanges will roll along the ground however the end flanges and hence the cable receiving core will not, the cable receiving core rotates at a speed sufficiently fast to pay out sufficient cable and prevent the cable becoming so tensioned that the cable becomes damaged. In order to wind the cable back up on the cable reel, the operator grasps the end flanges and rotates the cable receiving core via the end flanges. The cable will be wound gradually onto the cable receiving core without the operator having to manhandle the cable reel and drag the cable reel along the ground to maintain sufficient tension in the cable as it is being wound about the cable receiving core.

Referring to Fig 2 of the drawings there is shown a cross-sectional view of the cable reel of Fig 1. The cable receiving core is substantially hollow and the pair of operating flanges are connected together by way of a central elongate strut 13 passing through the hollow cable receiving core and connected to each of the operating flanges at it's ends. The central elongate strut is freely rotatable in the hollow cable receiving core.

Referring to Fig 3 of the drawings there is shown an alternative construction of cable reel in which like parts have been given the same reference numeral as before. The central elongate strut further comprises a two-part telescopic strut having a pair of strut sections 15a, 15b. Each strut section 15a, 15b has an operating flange connected thereto at one end and the other end 17a of strut section 15a fits inside the other end 17b of strut section 15b. The end 17a is slidable back and forth within the end 17b and a locking mechanism (not shown) is provided to releasably secure the operating flanges in position relative to each other.

Referring to Fig 4 of the drawings there is shown a cross sectional view of one type of locking mechanism that may be used to releasably secure the two operating flanges in position relative to each other. The locking mechanism comprises a bayonet fitting indicated generally by the reference numeral 19 having a pair of jaws 21a, 21b that may

be tightened and brought closer together or loosened and further separated by twisting adjustment member 23. The adjustment member 23 has a screw thread 25 for cooperation with a corresponding screw thread 27 on the pair of jaws 21a, 21b.

5 Referring to Fig 5 of the drawings there is shown another still alternative embodiment of cable reel according to the invention where like parts have been given the same reference numeral as before. The cable reel further comprises a handle 41 mounted on the outside face of one end flange radially offset from the central axis of the core. The cable receiving core has a central bore 43 extending substantially along its length and there is
10 provided an inner handle 45 rotatably mounted at the bottom central bore. The inner handle 45 comprises a base portion 47 rotatably mounted on the cable reel and a handle portion 49 secured to the base portion, the base portion further comprising an outwardly projecting lip 51 substantially surrounding the base portion 47 and extending orthogonally therefrom so that the hand (not shown) of an operator may be placed on the
15 handle portion 49 with the lip 51 substantially surrounding the hand of the operator to prevent injury of the operator's hand on rotation of the handle. The outwardly projecting lip 51 further comprises at its outermost end an annular flange 53 projecting outwardly and substantially orthogonal to the lip 51 and which lies along the external face of the flange. Ball bearings 55 are provided intermediate the annular flange and the external face of the flange to facilitate rotation of the handle. Further ball bearings 57 are provided intermediate the base portion and the bottom of the cable receiving core. The base portion 47 is rotatably mounted on the bottom of the central bore by snap fitting the base portion in position. A boss 59 located on the bottom of the cable receiving core is snap fitted through a hole (not shown) in the base portion. There are further provided ball bearings
20 61 located intermediate the handle mounted on the end flange and the end flange to promote rotation. One advantage of having an inner handle is that the cable reel may be laid flat on its flange.

It is envisaged that various different methods of attaching the inner handle to the cable
30 reel could be employed and it will be understood that only one possible way has been shown here. It is further envisaged that the two part handle could be snap fitted together

also for ease of construction using any suitably dimensioned base and handle portions. Furthermore two sets of ball bearings between the handle and the cable reel have been shown. It is understood that both sets of ball bearings need not be provided but a single set or indeed other means such as a lubricant would suffice to ensure proper operation of the device.

Referring to Figure 6 of the drawings there is shown another alternative embodiment of cable reel according to the invention where like parts have been given the same reference numerals as before. In this instance, both of the strut sections 15a, 15b are substantially hollow with the end of strut section 15a passing through the open end of strut section 15b. Pins 71a, 71b mounted on the end 17a of strut section 15a pass through a pair of complimentary slots 73a, 73b respectively formed in the strut section 15b. The dimensions of the slots 73a, 73b act to limit the movement of the operating flanges relative to each other. A locking mechanism 19 comprising an elongate locking arm 75 cranked intermediate its ends is pivotally connected adjacent its crank point to the interior of the strut section, one end of the locking arm forming a locking pin 77 and the other end 79 being accessible for manipulation by an operator of the cable reel. A slot 83 is provided on the strut section 15a to enable through passage of the locking pin 77. Similarly, a slot 85 is provided on strut section 15b to enable through passage of the locking pin 77 through strut section 15b. Biasing means are provided by way of a spring 81 to urge the locking pin 77 in the direction of the slots 83,85. Finally, the cable receiving core has an annular groove 87 formed therein around its circumference capable of receiving the locking pin.

In use, when the operating flanges 7, 8 are held spaced apart from the end flanges to allow the hands of the operator to grip the end flanges and rotate the cable receiving core, the locking pin 77 passes through the slot 83 in the strut section 15a and bears against the end 17b of the strut section 15b thereby preventing movement of the operating flanges inwardly towards each other. Further outwardly movement of the operating flanges thereby further separating the two operating flanges is prevented by the pins 71a, 71b in grooves 73a, 73b. When it is desired to store the cable reel the operator pushes the end 79

of the locking arm 75 inwardly towards the flange until the locking pin 77 is free of the slot 83 and no longer bears against the end 17b of the strut section 15b. In this position the operating flanges will be able to move inwardly relative each other. The operating flanges are then gradually brought together and the end 79 of locking arm 75 may be released. Once the operating flanges are in a fully stored position the slots 83 and 85 and the annular groove 87 will fall into alignment and the locking pin 77, under action of the biasing spring 81, will pass through the slots 83, 85 and rest in groove 87. In this way, the operating flanges will be held in a fixed configuration with respect to each other while the cable receiving core is permitted to rotate freely. In order to pull the operating flanges apart into an operating configuration once again the end 79 of the locking arm 75 is pushed inwardly in order to release the locking pin 77 from the slots 83, 85 and annular groove 87 and the operating flanges are pulled apart until pins 71a, 71b abut against the ends of slots 73a, 73b. The end 79 of the locking arm 75 is released once again and locking pin 77 passes through slot 83 in the strut section 15a and bears against the end 17b of the strut section 15b thereby preventing movement of the operating flanges inwardly towards each other.

It can be seen that the slots 73a, 73b are so dimensioned that the pins 71a, 71b are not permitted to rub against the cable receiving core. This helps to avoid excessive friction and does not inhibit the rotation of the cable receiving core. Furthermore, it will be understood that it is not necessary to provide a pair of pins 71a, 71b and a pair of slots 73a, 73b. In fact, a single pin and slot pair would suffice. It is envisaged that the end and the operating flanges may be provided with a lateral outwardly depending flanged rim that extends from adjacent the circumference of the flanges.

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Referring to Fig 7, there is shown a cross-sectional view an alternative construction of locking mechanism 19 for use with the cable reel according to the invention where like parts have been given the same reference numerals as before. For reasons of simplicity, only a portion of the strut section 15a of the cable reel has been shown but it will be understood that the remaining parts of the cable reel as shown in Fig 6 would also be provided. The locking mechanism comprises a securing pin 91 moveable through the

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aperture 83 in the strut section 15a. The securing pin 91 is actuatable by way of an elongate locking lever 95 whose end 97 is bent substantially orthogonal to the main axis of the locking lever 95, the securing pin 91 is rotatably connected to end 97 of the locking lever and the other end 99 of the locking lever being accessible for manipulation by a user of the cable reel. A spring 101 is provided to urge the securing pin into a locking configuration in which the securing pin 91 passes through aperture 83.

The operation of the locking mechanism will now be described but it will be understood that the securing pin 91 of the locking mechanism operates in substantially the same way as the locking pin 77 of the previous embodiment and may be located in the slot 85 and annular groove 87 in a similar manner in order to secure the operating flanges in a fixed relationship with respect to each other. In order to retract the securing pin within the strut section 15a, the end 99 of the locking lever is grasped by a user and then rotated to the position shown in the diagram. The entire locking lever will rotate and this causes end 97 connected to the securing pin to move away from the slot 93 thereby retracting the securing pin back through the slot. The operating flanges (not shown) may then be moved relative to each other with the securing pin 91 in a retracted position. Once the flanges are in the desired configuration the end 99 of the locking lever 95 is released and the spring 101 will rotate the locking lever until the locking lever is in a locking configuration once again. The locking lever including the end 97 rotate which causes the securing pin 91 to move outwardly relative the strut section 15a into the position shown in dotted lines. The operating flanges will then once again be held in a locked relationship with respect to each other in the manner previously described.

Referring to Fig 8 of the drawings there is shown a cross-sectional view of an alternative construction of locking mechanism according to the invention where like parts have been given the same reference numerals as before. The operation of the locking mechanism will now be described however it will be understood once again that for reasons of simplicity, only a portion of the strut section 15a has been shown but it will be understood that the remaining parts of the cable reel as shown in Fig 6 would also be provided. The locking mechanism further comprises a substantially horseshoe-shaped

expandable portion 107, the free ends of which terminate in outwardly depending spigots 108a, 108b, and an elongate wedge-shaped portion 109 housed inside the strut section 15a. The wedge-shaped portion 109 has a threaded portion 111 for engagement with a corresponding threaded portion 113 of the strut section 15a and a hand-grip 115 for manipulation by an operator of the device.

In use, in order to lock the operating flanges in a fixed relationship with respect to each other, the slot 85, annular groove 87 and the slot 83 are placed in alignment by collapsing the operating flanges towards each other in the manner previously described. The wedge-shaped portion 109 is then gripped by the hand-grip 115 and rotated thereby causing the wedge-shaped portion to advance inside the strut section 15a towards the expandable portion 107. Once the wedge-shaped portion 109 comes into contact with the horseshoe-shaped expandable portion 107 the outwardly depending spigots 108a, 108b of the horseshoe-shaped expandable portion are urged outwardly. On further rotation of the hand-grip 115, the outwardly depending spigots are pushed outwardly through slot 83 and are allowed to pass through slot 85 and enter groove 87. In order to expand the operating flanges outwardly into a working configuration, the hand-grip 115 is rotated in the opposite direction to withdraw the wedge-shaped portion 109 from between the arms of the horseshoe-shaped expandable portion 107 thereby allowing the arms of the horseshoe-shaped expandable portion to contract and retreat the outwardly depending spigots 108a, 108b back from the groove 87 through the slots 85 and 83. The two operating flanges may then be moved relative each other to a fully expanded configuration at which time the hand-grip will be rotated once more to separate the arms of the horseshoe-shaped expandable portion and force the outwardly depending spigots through the slot 83 whereafter they will prevent collapsing of the operating flanges in the manner previously described.

Referring to Figs 9, 10(a) and 10(b) of the drawings there is shown an alternative construction of locking mechanism for use with the cable reel according to the present invention where like parts have been given the same reference numerals as before. The operation of the locking mechanism will now be described however it will be understood

once again that for reasons of simplicity, only a portion of the strut section 15a has been shown but it will be understood that the remaining parts of the cable reel as shown in Fig 6 would also be provided. The locking mechanism comprises a pair of elongate locking members 121, 123 slidably arranged with respect to each other. One of the sliding locking members 121 has a spigot 125 located on one side thereof upon which there is rotatably mounted a cam 127. The other of the sliding members 123 has an inclined face for bearing against the cam 127 when the locking members 121, 123 are moved relative to each other. The locking members, cam and spigot are housed within the strut section 15a which is closed at one end by a disc 126. The slidable locking member 121, upon which the cam 127 is located, has a tapered end 128 which protrudes through an aperture in the disc 126 at the end of the strut section 15a. A spring 129 is mounted on the tapered end inside the strut section adjacent the disc and acts upon the slidable locking member 121 and disc 126 to urge the slidable locking member inwardly into the strut section 15a towards the other locking member 123. A cam handle 131 is pivotally mounted adjacent the end of the tapered end 128 of the locking member 121 external the strut section 15a, operation of which will cause the slidable locking member to move relative to the other locking member.

In use, the cam handle is pivoted by the operator and acts against the disc 126 which causes the slidable locking member 121 to move relative the other locking member 123. Movement of the cam handle from the position shown in Fig 10(b) to the position shown in Fig 10(a) will cause the locking member 121 to move towards the locking member 123. The Cam 127 comes into contact with inclined surface and will rotate clockwise until at least portion of the cam member protrudes outwardly from the slot 83 in the strut section 15a. This portion of the cam will be inserted through the slot 85 and in turn will be housed in the annular groove 87 when the operating flanges are in a stored configuration and when the operating flanges are in a working configuration the portion of the cam protruding through the slot 83 will act against the end 17b of the strut section 15b in the manner previously described. This will be understood from the previous description of the operation of the cable reel and will not require further explanation to be understood by the person skilled in the art.

In this specification the terms "comprise, comprises, comprised and comprising" and the terms "include, includes, included and including" are deemed totally interchangeable and should be afforded the widest possible interpretation throughout the specification.

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The invention is in no way limited by the embodiments hereinbefore described and may be varied in both construction and detail within the scope of the claims.

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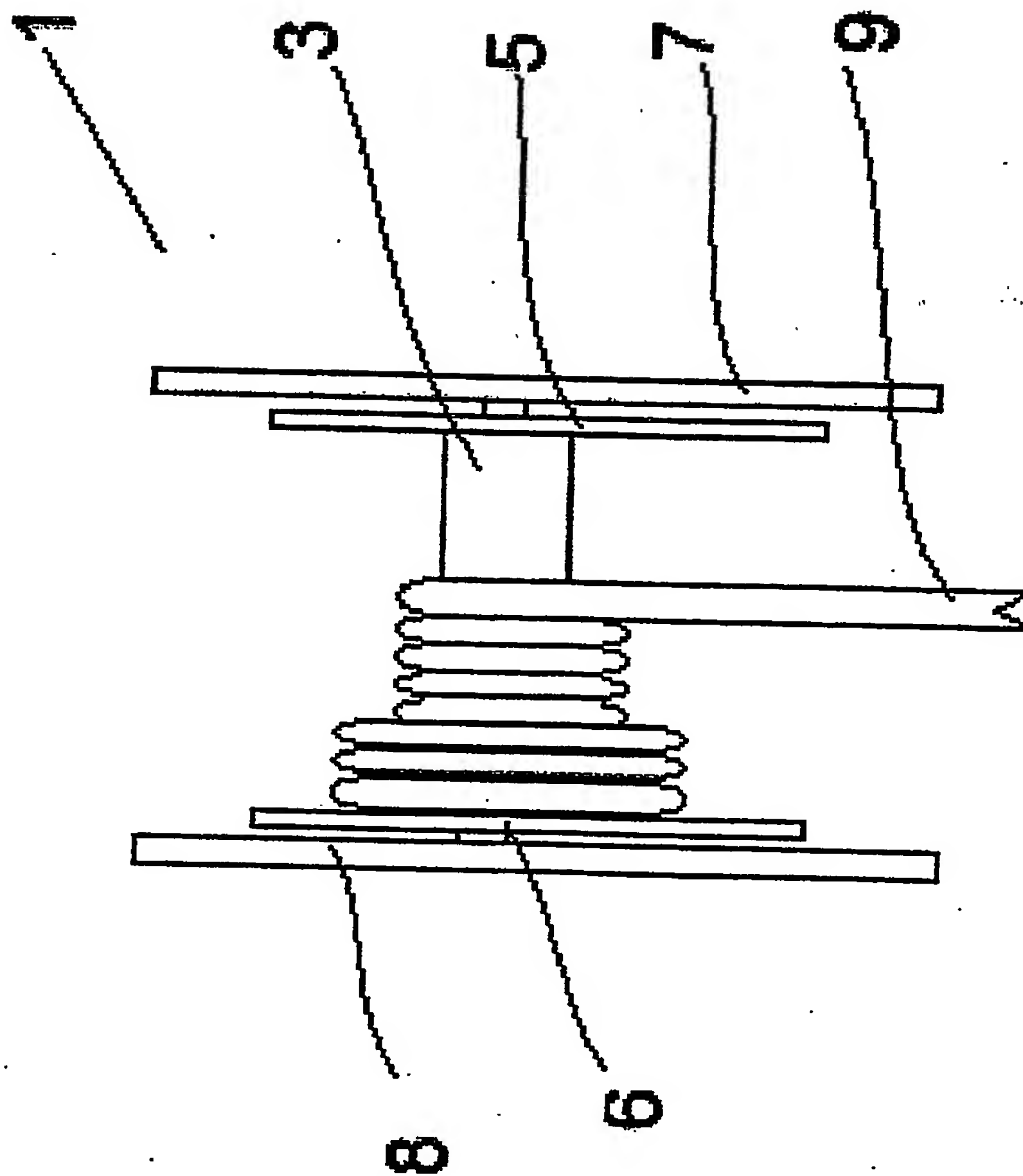


Fig 1

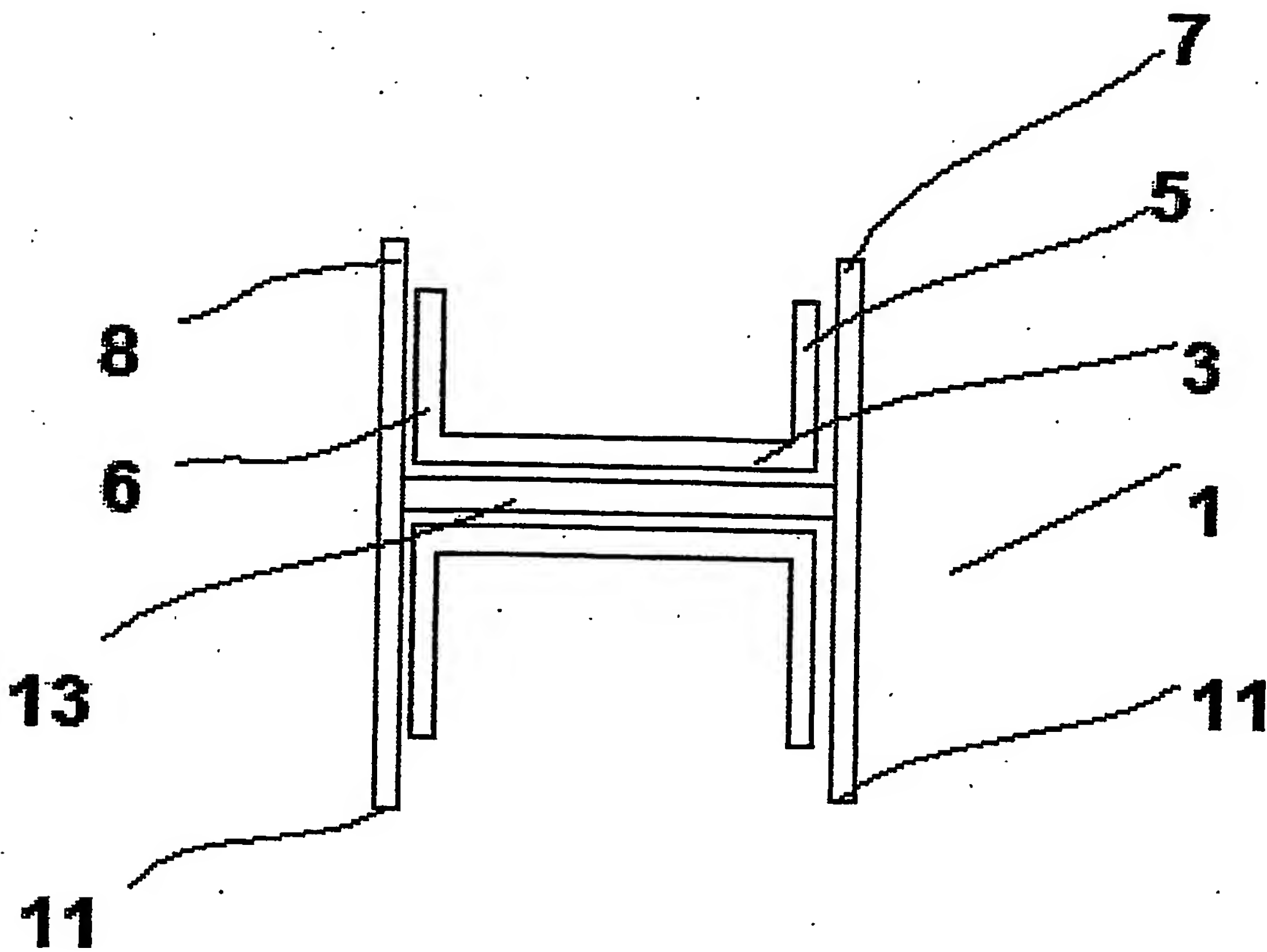


Fig 2

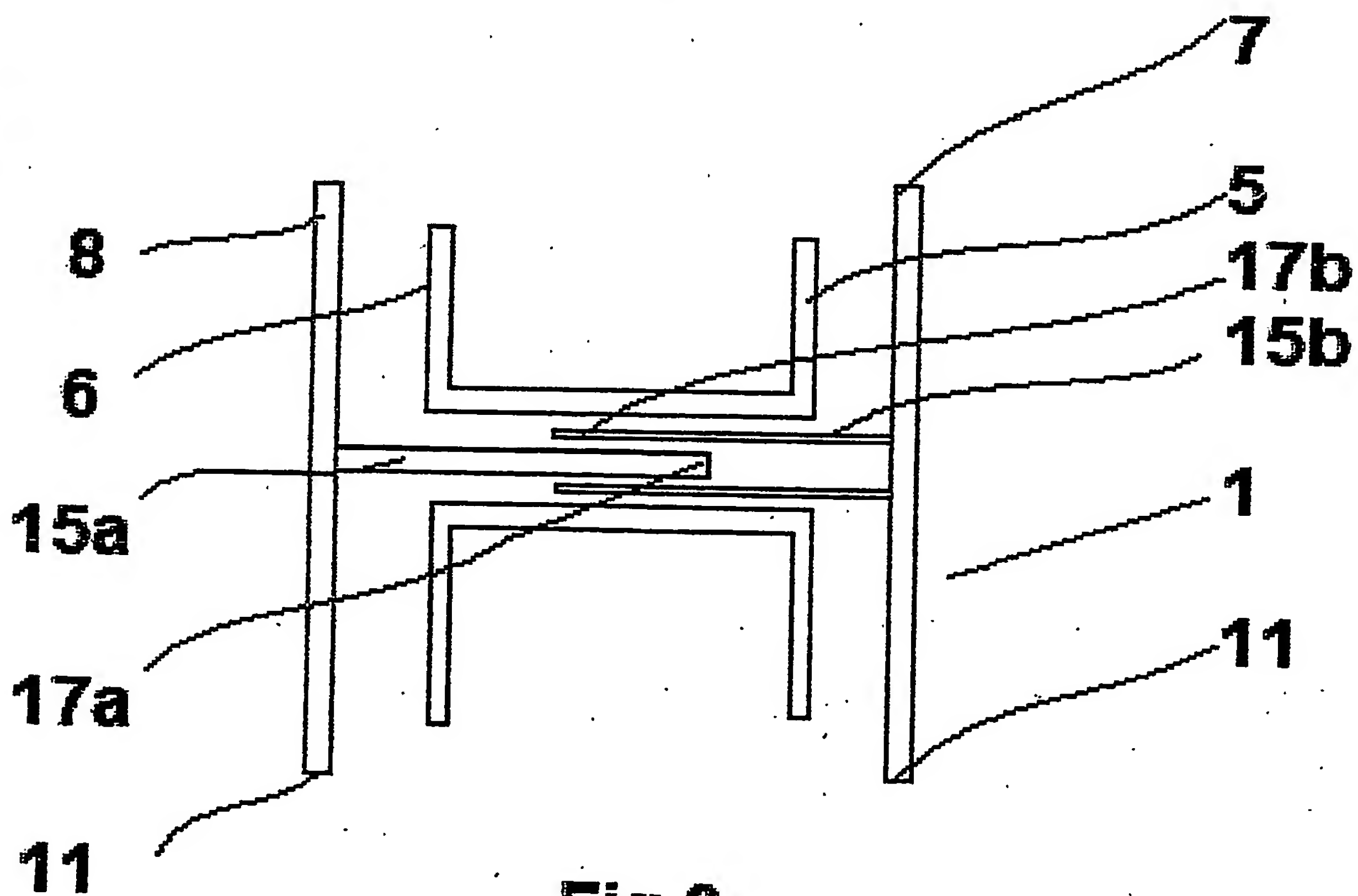


Fig 3

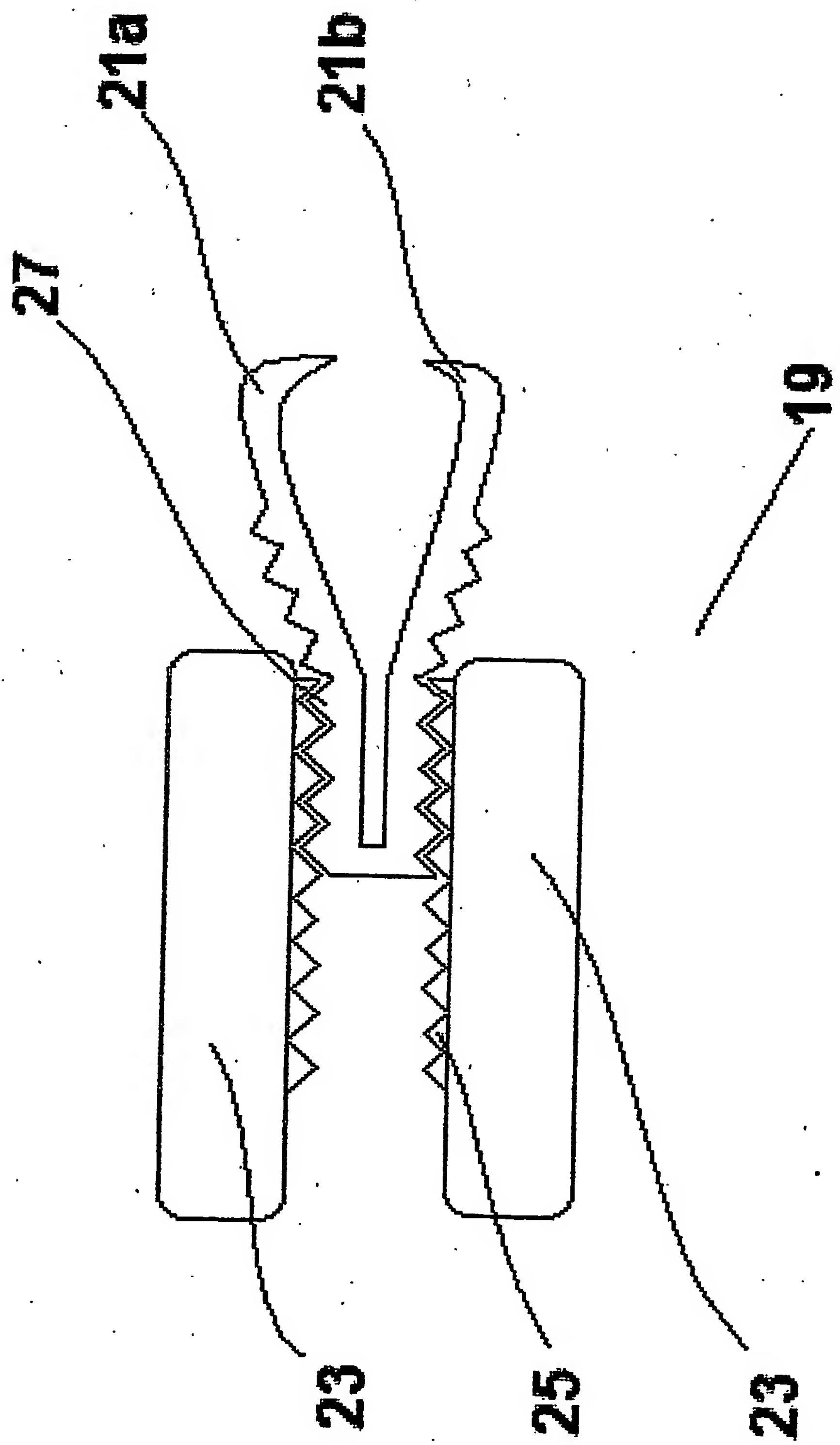


Fig 4

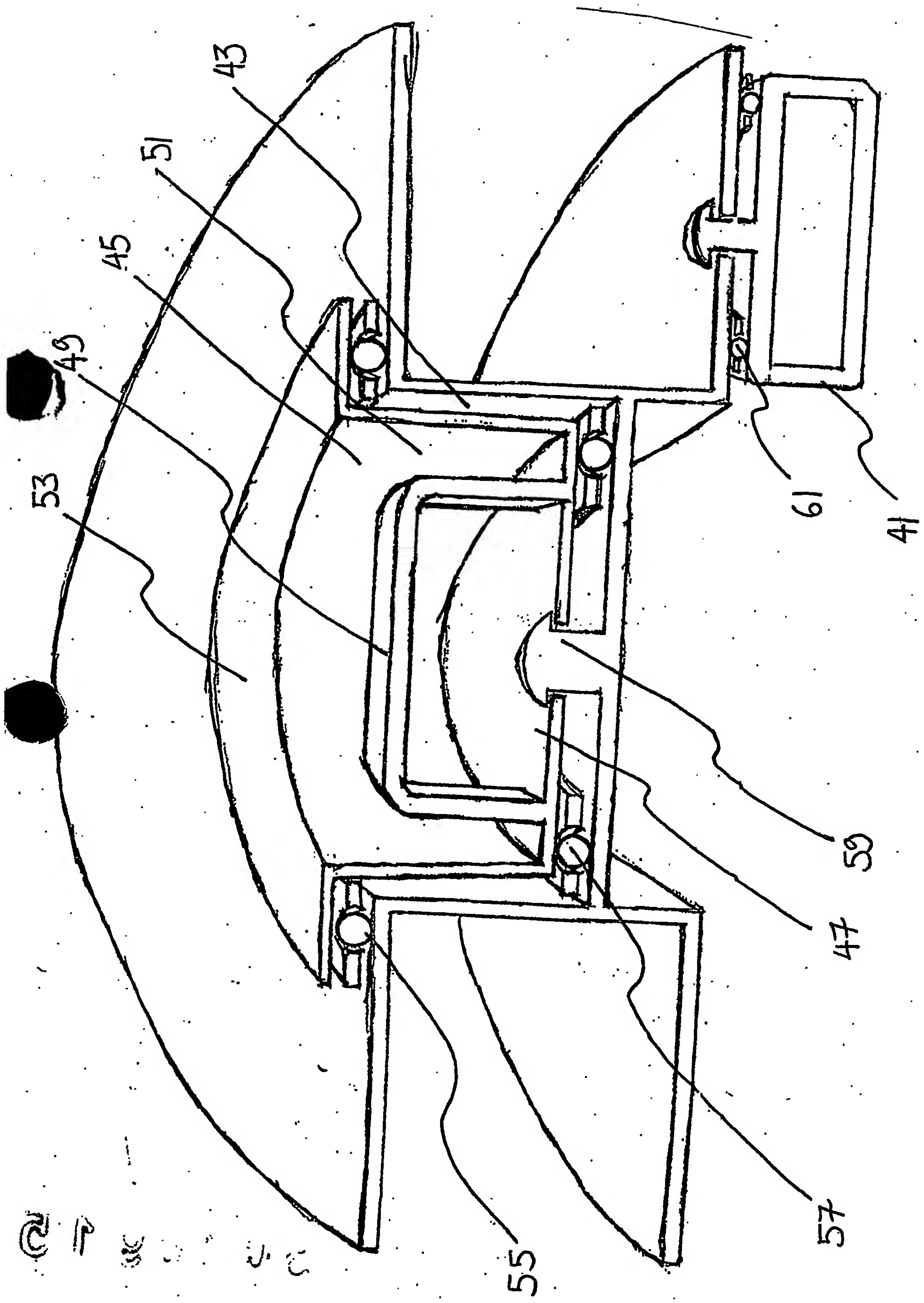


FIG5

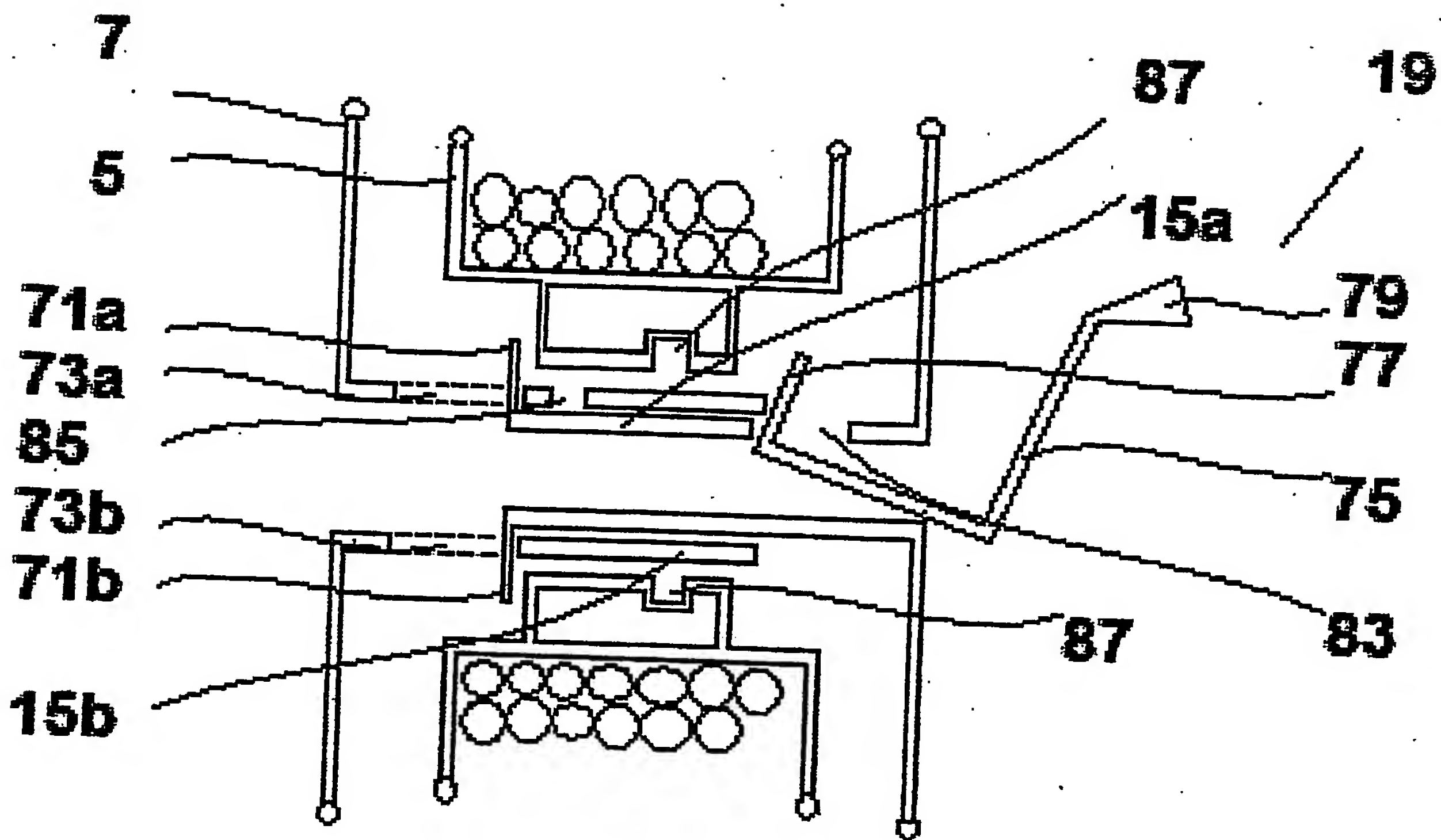


FIG 6

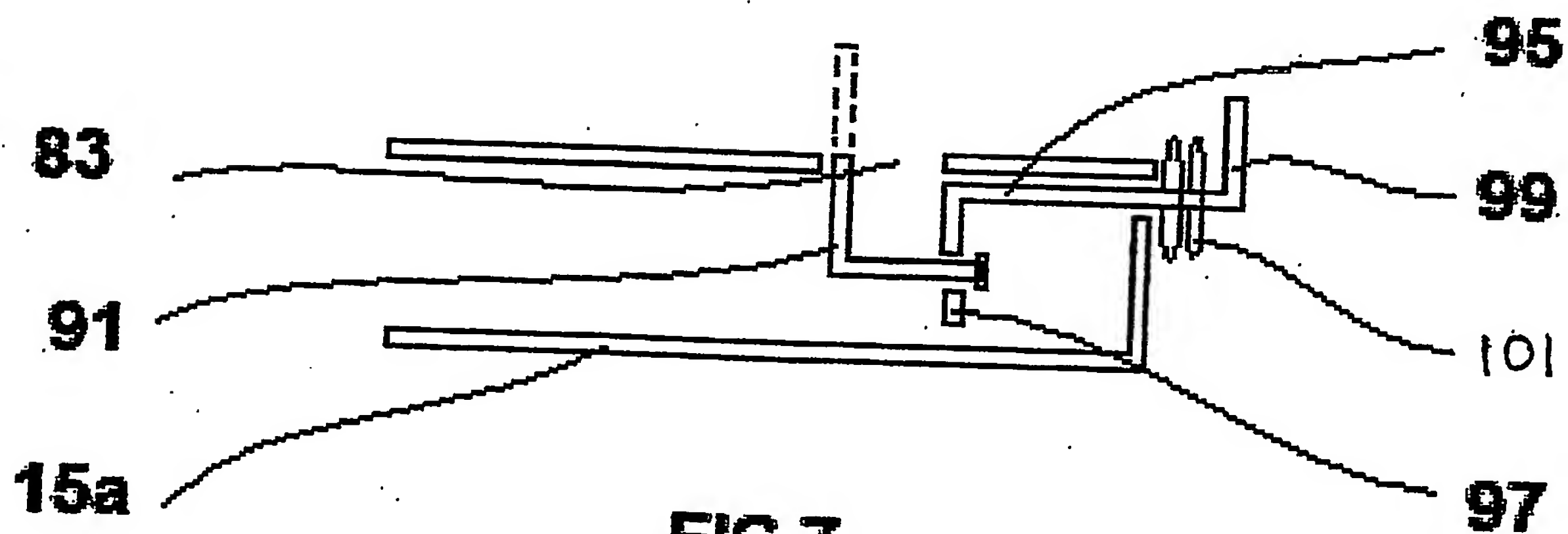


FIG 7

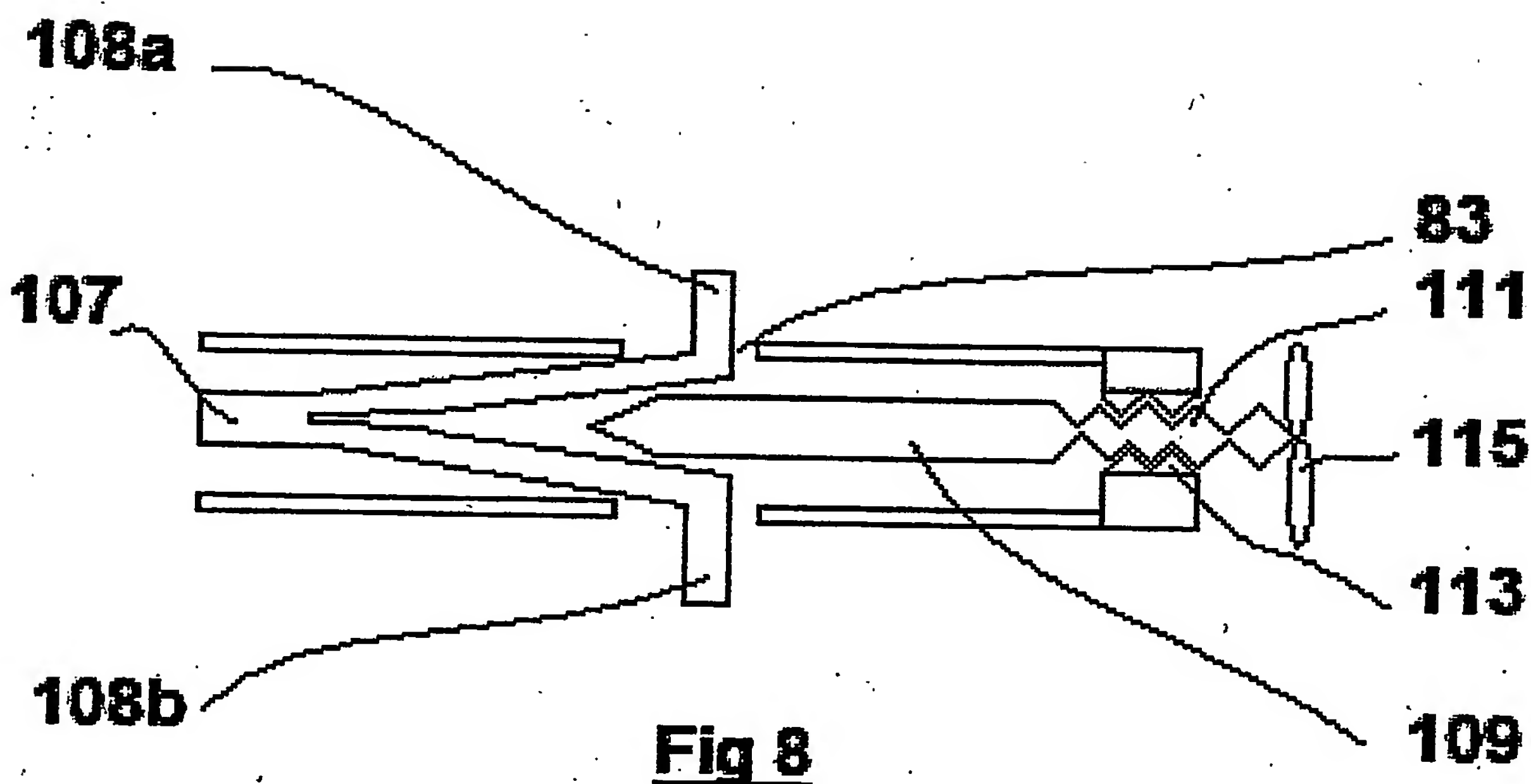
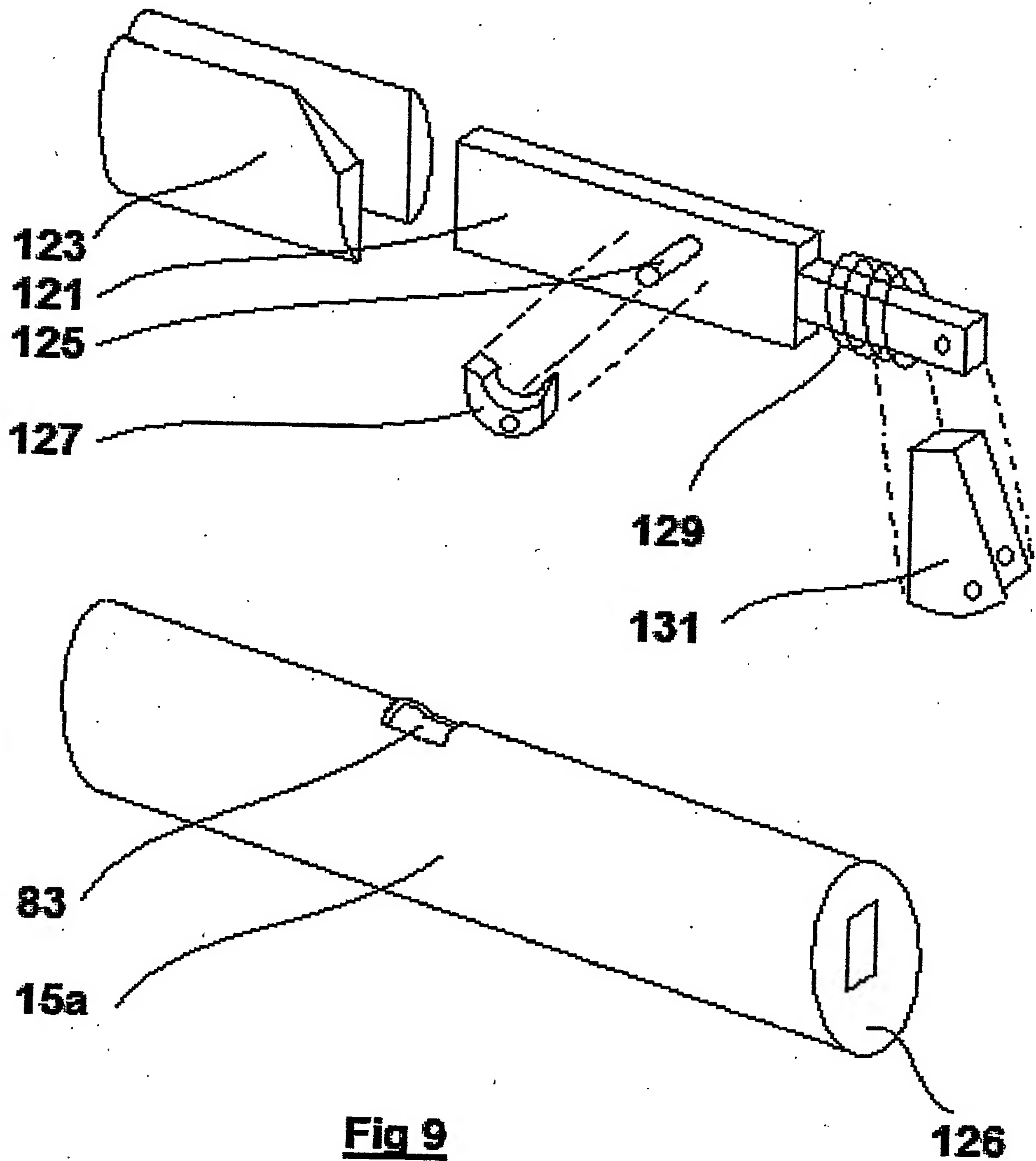


Fig 8

718



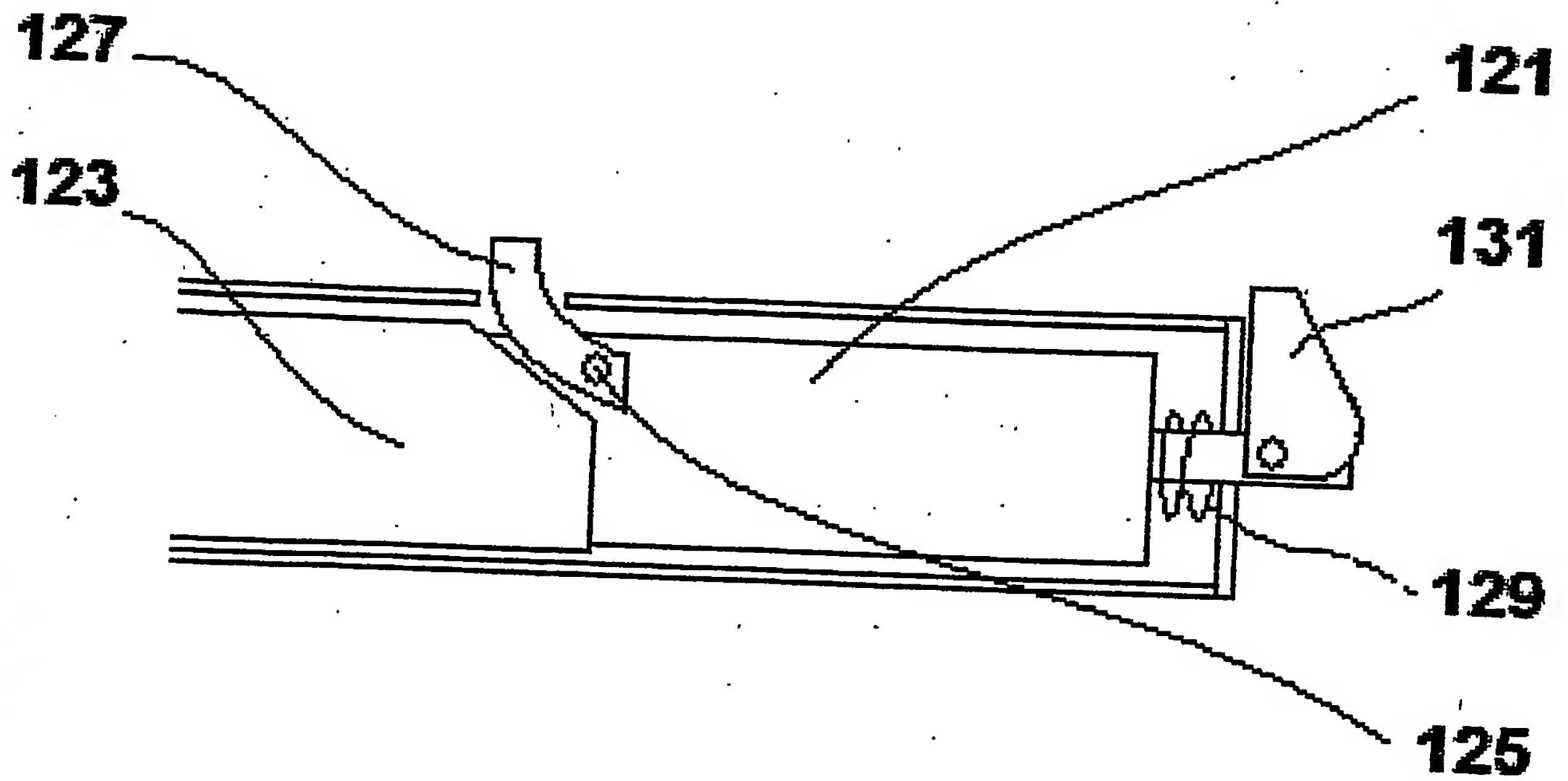


Fig 10a

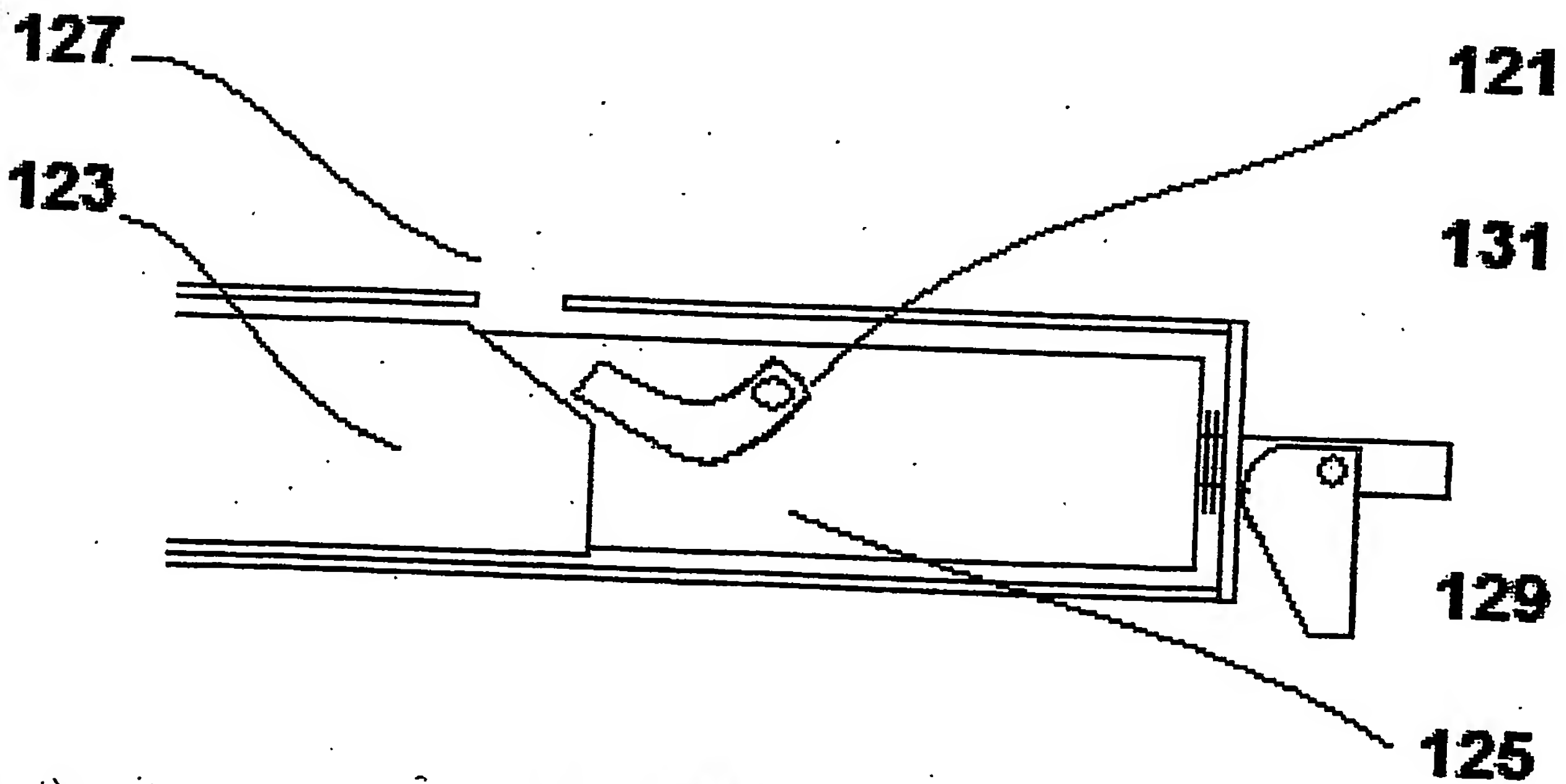


Fig 10b